

## **FLOWTRACKER ADV FIELD-TEST PLAN**

The objective of field testing the Flowtracker ADV is to compare discharge measurement data from the ADV to discharge measurement data from mechanical-current meter (conventional) or other acceptable USGS techniques (such as a flume measurement); and to provide feedback to the ADV manufacturer and USGS Hydroacoustic Wading Measurement project chief.

### General

Prior to the making the first discharge measurement, the tester should become familiar with the Flowtracker. The accompanying Flowtracker manual should be read and the unit tested in the office. The Flowtracker software contained on the accompanying CD should be loaded to the tester's field.

### ADV

Each day of testing, prior to the first discharge measurement, the ADV should be given a complete diagnostics check using the ADVCheck software, as documented in the Flowtracker manual (Section 6.6, p. 51 – 59). The ADVCheck diagnostic test should be logged to a file. The file name should include the date of the diagnostic test. The battery voltage and storage capacity are of special concern; follow the recommendations in the manual to insure adequate power and data storage capacity for the measurements planned.

Prior to each discharge measurement, the field diagnostics procedures described in the Flowtracker manual, Section 3.3.2, p. 22, should be completed.

The Flowtracker will be mounted to a standard top-setting wading rod using a special Flowtracker offset-mounting bracket. This bracket is designed to have the Flowtracker at the front of the rod, and it moves the Flowtracker sample volume to about 2 inches from the rod (without the bracket the sample volume is about 4 inches to the side of the rod).

The sample volume extends about 10 cm or 4 inches to the side of the transmitting transducer. Care must be taken to note about where the sample volume is located when making a measurement; for example, make sure the volume will not be striking any solid surface, including the bottom, rocks, leaves, or other debris.

Care should be taken to insure that the probe with the red band is facing downstream, and that probe is oriented correctly with regards to the tagline. An imaginary line drawn through the transmitting transducer, along the transmit beam, should be parallel to the tag line. The rod should be held level to prevent the sample volume from striking a boundary.

After completion of the Flowtracker measurement, the tester should record the relevant information, including discharge, displayed by the Flowtracker on a standard discharge

measurement note sheet. The binary measurement file stored by the Flowtracker should be downloaded to the tester's PC and immediately backed up onto a diskette.

### Site

The test site should be at an existing USGS streamflow-gaging station.

Steady flow conditions should exist during the testing period; gage heights and discharges should be stable during the period.

Sites with stable stage-discharge ratings are most desirable for the tests.

A Flowtracker discharge measurement should be made in accordance with all USGS methods, procedures, and policies regarding conventional discharge measurements.

Special care of the Flowtracker transducers is needed so they are not scratched. The unit should be carried in its case until the measurement is ready to be made, and special care should be taken to not strike anything with the probe head. The probe arms are very strong but the transducer faces could be damaged, resulting in bad data collection.

### Discharge measurements

Immediately prior to the measurement a water-temperature reading should be made near the Flowtracker probe head and recorded on the measurement note sheets. This is to confirm the Flowtracker is reading temperature correctly. Any errors in the Flowtracker temperature reading could seriously compromise the Flowtracker data

The ADV will be mounted to a standard USGS top-setting wading rod and an acceptable tag-line will be used for station-keeping.

A non-ADV comparison discharge measurement will be made, preferably by the same person who made the ADV measurement. However, if flow conditions are changing, it may be necessary to have two persons make the measurement nearly concurrently.

Mechanical meters used for conventional comparison measurements will have met quality assurance standards (i.e. spin tests, no visible cup dents).

USGS methods and policies for making mechanical meter measurements will be used (as relevant to the ADV) when making the ADV discharge measurements. This includes vertical methods (0.6 or 0.2 and 0.8), number of stations, etc. Vertical method for the ADV should be according to USGS guidelines and should be the same as that used for the mechanical meter (the ADV has a feature where if the 0.8 shot is higher than the 0.2, the user is prompted to also take 0.6 shot – this should be done if it occurs, and also done with the mechanical meter at the same station).

The exact same tag-line stations and depths will be used for both the ADV and mechanical meter measurements. This will facilitate comparison of individual station data and error analysis.

If the conventional (Price meter) or other comparison measurement departs from the gaging station rating by more than the percentage associated with the quality of the measurement (5 percent for good, 8 percent for fair), then a check measurement should be made according to USGS policy, unless the Flowtracker measurement confirms the comparison measurement (the Flowtracker measurement would serve as a check measurement in this case).

If the tests are performed at a site where the rating is not reliable (for example a new rating defined by several measurements, conditions are outside the rating range, or the ratings are consistently unstable) the difference between the comparison and Flowtracker measurement should be the criteria for whether or not a check measurement needs to be made.

In low-flow conditions, if time permits, testers are encouraged to also use a flume in conjunction with Flowtracker and Price measurements – this gives a third, independent measurement.

A special note of caution – if Price Pygmy meters are used as the comparison measurements in low-flow conditions, if the bucket wheel stops turning the tester should not “bounce” the meter to free up the bucket wheel. This can produce erroneous velocity measurements; this is particularly undesirable in an instrument comparison effort.

If time permits, and there is access to a turbidimeter, it would be desirable to take one sample in the stream and record the turbidity. If a turbidimeter is not available, a note about the observed turbidity should be recorded (for example, clear, muddy, etc.).

The quality of discharge measurements should be estimated using USGS Open File Report 92-144, Determination of error in individual discharge measurements. Software is available that will compute the error as described in the report. The software may be obtained at: <http://water.usgs.gov/software/measerr.html>. The quality of the ADV measurement will be estimated later using these methods, but several parameters need to be yet assessed before this can happen.

## Documentation

Please submit all documentation to Mike Rehm as soon as practical. The documentation should include all relevant conventional measurement documentation including copies of measurement notes, Aquacalc or DMX-pro files, departures from

station ratings, etc. The ADV documentation should include all notes related to the ADV, and electronic measurement and diagnostic files. Please also supply any feedback about use of the Flowtracker. Your feedback will be shared with the manufacturer for possible future upgrades or improvements.

If you do happen to take any digital photos of the testing, please submit these as well. They may be posted on the project web site and used in reports.

If problems occur or questions arise, please contact Mike Rehmel:

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